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School of Public Policy and Urban Affairs



On-Site Food Waste Disposal Systems

Capstone presentation by Isaac Griffith-Onnen and Zak Patten

Presentation Outline

- Project overview
- Overview of Three On-Site Technologies
 1. Isaac Griffith-Onnen: Pulpers/Shredders & Dehydrators
 2. Zak Patten: On-Site Composting & “Dry” Systems
 3. Zak Patten: Biological Liquefaction (“Wet” Systems)
- Overall Considerations
- Next Steps
- Questions?

Project Overview

MassDEP GOAL: Divert at least 35% of waste from disposal by 2020; 350,000 tons

Policy:

Food waste disposal ban in 2014 on institutions generating one ton or more of food waste.

Project Objective:

To help affected institutions gain a better understanding of on-site options for managing food waste.



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Non-Biological Volume and Weight Reduction



Technology Overview

- Mechanical, not biological
- Reduce weight & volume by removing water
- Product is not compost
- Two major types:
 - Pulpers/shredders
 - Waste dehydrators



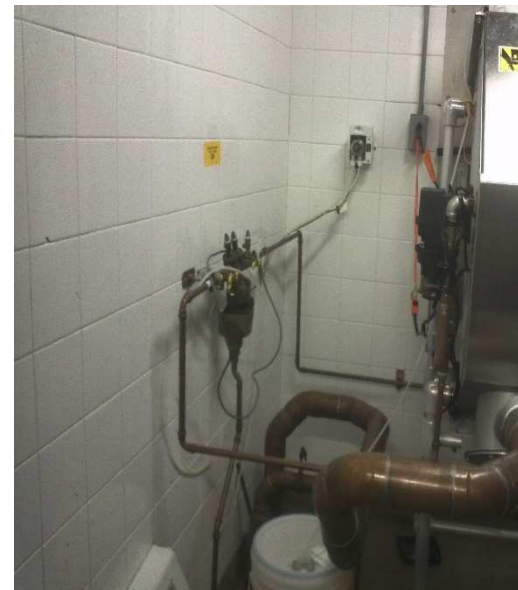
Pulpers/Shredders: How They Work

Pulpers

- Pulped into a slurry.
- Water is removed (may be recycled).
- Pulp is discharged.

Shredders

- Waste is ground up.
- Water is pressed out.
- Lower electricity/water use.



Pulpers/Shredders: What goes in?



Mixed food waste and plastic



"Pure" food waste

Pulpers/Shredders: What comes out?

- Pulped food waste.
- Consistency of coffee grounds.
- Large volume reductions.
- Can go into other systems.



Pulpers/shredders: Advantages and Disadvantages

Advantages

- No additives.
- Large volume/weight reductions.
- Accept mixed waste.
- Feedstock for other systems.

Disadvantages

- No long-term storage.
- Landfill methane emissions.
- Odors and vermin.
- Electricity use.



Source: InSinkErator

Dehydrators: How They Work

- Use heat and mechanical processes to break up and dehydrate waste.
- Most are batch systems.
- Cycle times vary (8-20+ hours).
- Variety of sizes and capacities.



Source: Somat Company

Dehydrators: What goes in?

- Food and other organic waste.
- Some can accept a mixture of food waste and paper.
- Pulped food waste can be a feedstock.
- Cannot process large, hard items, e.g. beef bones.



Whole food waste



Pulped food waste

Dehydrators: What comes out?

- Dry, odorless, stable biomass.
- Can be stored for several months.
- Large volume and weight reductions.
- Product is not compost.



Source: GaiaRecycle



Dehydrators: Advantages and Disadvantages

Advantages

- Large volume and weight reductions
- Stable product.
- May reduce waste pickups.
- No additives.

Disadvantages

- Can add to total system cost.
- Product is not compost.
- Product may not be suitable for soil application. Testing recommended.



Source: GaiaRecycle

Case Study: Framingham State University



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On-Site Composting & “Dry” Systems

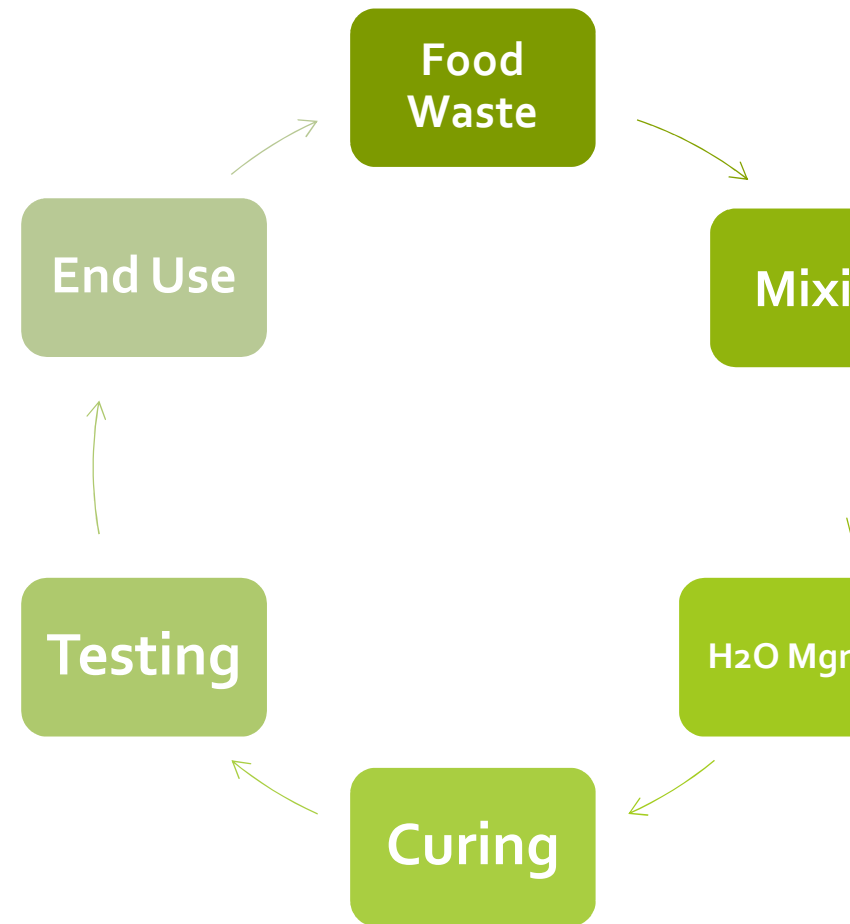


In-Vessel Benefits

- Controlled process
- Faster decomposition
- Product quality
- Effects of weather diminished
- Staffing
- Collection/hauling costs
- End product use



How the System Works



Sample models

Hot Rot Composters - 1206 and 1811 Models

Continuous in-vessel



Modular; Fully enclosed



The Rocket



Continuous Feed
Self-contained
Content in vessel for 14 days
Brown matter needed: wood chips

BioGreen 360



Continuous feed

Self-contained

High heat

Microorganisms

24-hour process

End product storage

Dry Compost Systems: End Product

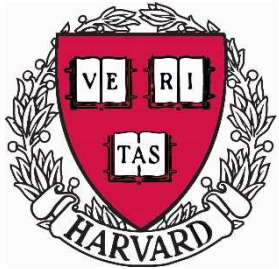
- 70-95% dry
- Mulch, soil amendment, compost

*Example of output:
740 lbs. ➡ 35lbs. of compost

*BioGreen 360



In Vessel Compost Systems: Case Study



Harvard University

11 tons of food scraps
composted weekly

Two on-site systems:

- Somat pulping machines
- BioGreen 360

Other Installations

Fairmont Copley

Roche Brothers

Cambridgeside Galleria

Johnson and Wales

Tower City Mall, Ohio

Other In-Vessel Dry Compost Vendors




Big Hanna

Susteco AB, Gothenberg, Sweden


In-Vessel Considerations and Recommendations

- Costs
- Siting; on-site development
- Equipment (purchase, lease, maintenance)
- General labor
- Process management and oversight
- Marketing/public and private partnerships and collaboration
- End-product compost use, distribution and/or disposal

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Biological Liquefaction/ “Wet” Systems



What is a wet system?



Major vendors



Totally  Gree



What food can go in? What can't?

 YES PLEASE	 NO THANKS
All Meat (raw or cooked), EXCEPT....	Big Bones or Fat Trimmings
All Fish and Shellfish (raw or cooked), EXCEPT....	Clam or Mussel Shells
All Fruit and Vegetables, EXCEPT....	Pineapples or Corn Husks
All Bread, Cakes and Pastries, BUT NO...	Raw (uncooked) Bread Dough
All Prepared Foods, BUT NO...	Packaging of Any Sort
All Dairy Products	
All Other: Egg Shells, Coffee Grinds, Pasta, etc.	Fryer Oil, Hot Soup, Frozen Items,
	Twist Ties, Rubber Bands, Plastic Bags, Gloves,
	Paper, Cardboard, Glass, Cans, Silverware



Key question: What comes out?

- Vendor view: benign, even beneficial



- View of some municipalities: not safe for sewer disposal

Case Study: Markville Shopping Centre (Ontario, Canada)



- Installed Orca Model OG2400 Oct. '12
- Off-site organics hauling: \$3,353/mo.
- On-site wet system: \$2,235 /mo.

Recommendations

Compliance with
municipal wastewater
standards



Ensure facility meets
utility requirements



Budget/Return on
investment

System Comparison

Systems Studied	Input	Output	Advantages	Considerations
Pulpers/Shredders	Organics, mixed kitchen waste	Waste pulp	Waste volume reduction	Storage of end product
Dehydrators	Pulped or unpulped food waste	Sterile Biomass	Volume reduction w/o additives	Output not compost
Composters/"Dry" Systems	Compostable food waste	Compost	Ag-Friendly output	Time, proprietary mix
Biological Liquefaction/"Wet" Systems	Compostable food waste, proprietary additive	Effluent	No hauling costs	Is effluent sewer compliant?

Overall Considerations

Waste audit	Region and Weather
Capital costs; initial investment high	Program monitoring
Comprehensive collection system needed	Transportation costs
Plan for end-user/disposal still necessary	Staff training
On-site and surrounding space/land a consideration	ROI varies by institution

Recommendations for Mass DEP

- Hold vendor fair
- Lab test of system end products
- Performance testing vs. manufacturer claims
- Environmental life-cycle assessment of systems



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Questions?